

RESEARCH

Open Access



“If you show them respect, you’re going to [get] respect back”: a theory for engaging First Nations for knowledge translation within a national nutrition and health survey

Jolian Wong¹, Treena Wasontio Delormier², Dave Bergeron³, Hing Man Chan⁴, Pamela Gabriel-Ferland⁵ and Brittany Wenniser:iostha Jock^{1*}

Abstract

Background Knowledge translation (KT) research aims to bridge the gap between research results and application which is vital to addressing health inequities. Despite the increasing emphasis on engaging Indigenous communities in research, there is limited research examining how to effectively engage communities to achieve Indigenous KT. The Food, Environment, Health, and Nutrition of First Nations Children and Youth (FEHNCY) is a nationally representative survey collaborating with First Nations’ (FNs) communities across Canada to inform policies and programs. The FEHNCY Community Engagement and Mobilization (CEM) supports partnerships with participating FNs communities and the application of study findings into action. This formative research aimed to examine how, for whom, and in which circumstances community engagement approaches support KT within FNs communities.

Methods Data were generated with one rural and one semi-urban community participating in the FEHNCY pilot from the Atlantic and Eastern regions of Canada, respectively. A total of 26 in-depth interviews were conducted, 1 modified Talking Circle with community partners and 2 focus group discussions with the FEHNCY team. We used a realist approach combining inductive and deductive coding stages to develop a middle-range theory examining the connections between community engagement and KT.

Results Our findings highlight the contexts, interventions, mechanisms, and outcomes that create pathways to KT. The participants described the societal, study and community contexts that affected engagement processes. The essential community engagement strategies included supporting Indigenous leadership in the research, supporting community decision-making, promoting project visibility, applying youth-specific engagement strategies, and incorporating FNs knowledges. The participants also described that centering positive relationships between research and community partners and valuing FNs knowledge systems were essential mechanisms for supporting KT. Lastly, participants highlighted KT outcomes namely, community self-determination in research, improved research findings and application of results for FNs benefit.

*Correspondence:

Brittany Wenniser:iostha Jock
brittany.jock@mcgill.ca

Full list of author information is available at the end of the article



© The Author(s) 2025. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

Conclusion This research can inform the strategic use of community engagement in research for KT among FNs. This study is the first to generate a middle-range theory using primary data collection for supporting KT through community engagement approaches in Indigenous health research.

Keywords Theory, Realist evaluation, Knowledge Translation, Community engagement, Indigenous health

Introduction

Knowledge translation (KT) research supports the application of research findings to address health inequities. The Canadian Institutes of Health Research (CIHR) defines KT as “a dynamic and iterative process that includes synthesis, dissemination, exchange and ethically-sound application of knowledge to improve the health of Canadians” [1]. In Canada, Indigenous Peoples refers to three groups: First Nations (FNs), Inuit, and Métis [2], each with a diversity of cultures, languages, and knowledges. Moreover, there are 600 diverse FNs with more than 60 different languages spoken across Canada [3]. Considering the diverse and multicultural communities in Canada which includes Indigenous Peoples, KT can be conceptualized differently among different communities. Falling within integrated KT approaches, Indigenous KT is the sharing of knowledge that can bridge knowledge to action and is contextualized for the local community with transferable relevance for other Indigenous communities [4, 5]. Smylie et al. further described Indigenous KT using a decolonizing framework that emphasized equally valuing Western and Indigenous knowledge systems and partnership with Indigenous communities [4, 5]. Within Indigenous contexts, Community-Based Participatory Research (CBPR) is an approach for decolonizing research that involves shifting from research conducted on Indigenous Peoples to research by and with Indigenous Peoples to support the application of study findings into action [6–9]. CBPR shifts research to a partnership between the research team and community and aims to equitably involve all partners throughout the research, researching community priorities to generate knowledge for change in health inequities [6]. Furthermore, engaging with communities has been mandated in national and international law including the Royal Commission on Aboriginal Peoples by the Indian and Northern Affairs [10] and the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) Guidelines [11] and has become imperative in research ethics as outlined in Chapter 9 of the Tri-Council Policy Statement (TCPS) for research involving the FNs, Inuit and Métis Peoples of Canada [12]. These policy documents are in alignment with Canada’s duty to consult [13] and Truth and Reconciliation Commission’s Calls to Action [14] and are pushing forward accountable ways to recognize Indigenous Peoples’ rights to self-determination.

Beyond the requirement to engage Indigenous communities, there has been little advancement in the development of frameworks that connect effective community engagement to Indigenous KT. We defined community engagement as ways in which Indigenous communities are equitably involved as partners with the research team throughout the research, focusing on community priorities to generate knowledge for change, which is essential for KT [6]. A recent scoping review of participatory research practices with Atlantic Indigenous communities in Canada revealed a lack of change in community engagement practices pointing to the limited data available rather than no engagement [15]. Of the studies that have documented their community engagement activities, most included formal meetings with a group that was seen as credible by the community (e.g., leadership, advisory board, organizations) and end-of-grant KT activities [16–21]. The mechanisms identified in these studies were largely anecdotal reports by researchers linking engagement to KT outcomes rather than primary data collection including perspectives from researchers and community members. Rasmus conducted interviews on community engagement and found that community ownership, cultural safety¹ and community champions were vital to research partnerships with a Yup’ik Alaskan Native community [22] while Thurber et al. highlighted that trust and reciprocity in relationship building impacted survey participation of Indigenous Australian children [19]. Other studies have postulated researcher accountability [23] and building relationships that involved multisectoral collaboration [18, 24–26] as additional mechanisms for achieving study outcomes. Similarly, to explain their findings, authors hypothesized KT outcomes of community engagement as improved validity of research [22], relevant research findings [19, 24, 26, 27] and research dissemination activities [18, 25, 26]. Although some

¹ Cultural safety was broadly defined within the FEHNCY team as valuing First Nations knowledge systems on par with western science. A recent report published by the NEIHR-Qc more fully discusses cultural safety in health research and can be summarized as understanding cultural safety as both an outcome and an approach. The first is a space where diverse Indigenous identities and experiences are promoted and deemed as “safe” by Indigenous individuals involved and the latter, a process of learning about the history and cultures of Indigenous peoples, fostering accountability and transparency in partnerships, practicing reflexivity to uncover biases or prejudices, working to eliminate power imbalances and respecting the rights to self-determination of Indigenous research partners [33].

authors have examined tribal policy changes as a KT outcome [28] and called for interventions that impact multiple levels on the socio-ecological framework [29], few studies in the literature have connected changes in policy and programs to KT outcomes. Capacity building as a KT outcome has been well documented in a recent systematic review on current KT practices in Indigenous health research [18] as well as other KT research studies but the range of KT outcomes benefitting Indigenous communities across socio-ecological levels remains underexamined [4, 23, 30]. Of the studies that described the program context or partnership characteristics, few have highlighted the impact of the community context on mechanisms and outcomes for achieving KT. Jock et al. identified that historical trauma, tribal politics, and varying perspectives on tribal policies were elements of the community contexts that impacted the development of policy, systems, and environmental changes supporting obesity prevention in Native American communities [28]. Previous studies have put forth frameworks that include aspects of participatory research, cultural safety and KT such as a critical review of an integrative practice framework highlighting partnership stages and KT as a way to impart meaning and drive the participatory process [31]. A strong integration of culturally safe research practices was demonstrated in an adapted Consolidated Framework for Implementation Research (CFIR) to a Kaupapa Māori methodology where culture-centered and relational approaches were key in the community co-design process to implement a health intervention [32]. While these frameworks [31, 32] and discussions centering Indigenous voices in health research contexts contribute to our understanding of cultural safety, where diverse Indigenous identities, experiences and realities are valued [33] and as such have advanced the science of community engagement research, more data collection is needed to develop a comprehensive theory that connects community engagement and the integration of cultural safety to KT within Indigenous contexts. While research on community engagement is growing, there are gaps in understanding what essential engagement strategies in which contexts are needed to activate mechanisms for KT outcomes related to changes in policy and programs.

This study can address these gaps by first, exploring KT outcomes that include community perspectives to inform policy and programs that can expand knowledge on KT processes in research. Second, conducting primary data collection to identify vital mechanisms that activate KT outcomes. Third, understanding the vital intervention strategies that characterize effective community engagement approaches to trigger mechanisms. Fourth, integrating an in-depth understanding of the context and

how it interacts with community engagement is needed to assess the transferability of findings with FN communities to other Indigenous contexts. Further, no previous research has used realist approaches to examine the contexts, interventions, mechanisms, and outcomes for how community engagement supports KT. Therefore, this qualitative research paper aims to examine how, for whom, and in what circumstances community engagement support improved conditions for Indigenous KT. This aim helps define KT outcomes, identify the mechanisms that connect to KT outcomes and the vital intervention strategies that trigger mechanisms and understand how the context impacts these processes.

Methods

Parent study

This study was conducted with two pilot communities as part of the first phase of the Food, Environment, Health and Nutrition of First Nation Children and Youth (FEHNCY) study, which aims to advocate for policies and programs that address FNs' nutrition, environment, and health needs. Over the next years, FEHNCY is collecting survey data from FNs households living on reserve across Canada. The goal of FEHNCY Community Engagement and Mobilization (CEM) was to apply CBPR principles and Indigenous KT approaches to partner with FNs communities to support KT. To achieve this aim, the CEM was based on Indigenous KT approaches from previous literature [34] including relationality and cultural safety [4, 5, 35]. and designed to include multiple levels of engagement; within communities, research teams, and governance levels. This qualitative, formative research described in this paper was conducted to understand the context, intervention strategies, mechanisms and KT outcomes that is grounded in the experiences of the two pilot communities of the FEHNCY study, Kanehsatà:ke and Miawpukek FN.

Participating communities

FEHNCY sought community approval and collaboration with participating communities, establishing Community Advisory Circles (CAC) in each participating community and continued with research in partnership with the CAC throughout.

The initial pilot community FEHNCY worked with was Kanehsatà:ke, a Kanien'kehà:ka (Mohawk) community situated on unceded traditional territory located in the Eastern region of Canada. Kanehsatà:ke is a semi-urban community that is rich not only in their diversity but also in their resourcefulness. Languages spoken include traditional Kanien'kéha, as well as English and French. Cultural and spiritual beliefs include cultural traditions,

as well as religious and faith-based practices. They are historically and still known as a fierce people, who stand strong together to defend their land, their people, and their rights when the need arises. Even though the community continues to live with the impacts of colonization and collective trauma which has resulted in high apathy and low community engagement, it is a community of people who care deeply about their land, their members and the future generations. Many community members have maintained traditional food practices, despite the effects of the current colonial system that continues to disrupt traditional foodways. Recent concerns have been centered around multiple environmental contaminants and their impacts on community members' health, which in large is why community members of Kanehsatà:ke wanted to participate in the FEHNCY study. Kanehsatà:ke was invited to participate based on existing relationships from previous collaborations with research team members.

The next pilot community is Conne River also known as Samiajij Miawpukek, a Mik'maq community on the Connaigre Peninsula and the only reserve on the island of Newfoundland. They are a rural community located ~150 km from the closest large community (Grand Falls-Windsor) and are accessible year-round by car. Although the number of registered band members living in Miawpukek has decreased by approximately 10% since 2017 (pre-pandemic), the percentage of registered band members less than 25 years of age remains steady

at close to 35% [36]. The community actively participates in traditional food activities such as fishing and hunting, which are among their main food sources. Miawpukek is currently revitalizing the traditional knowledge and language in the community through their vibrant cultural and arts centers and language teaching at schools. Among FNs in the Atlantic region, Miawpukek was randomly selected to participate in the study. With the support of the Assembly of First Nations, Miawpukek was invited to participate in a knowledge-sharing workshop to learn more about the FEHNCY study before entering this research collaboration.

Data generation

Data were generated in 3 parts to triangulate by method and participant groups (Table 1). The start of data generation supported an in-depth understanding of experiences of community engagement for KT from Kanehsatà:ke using in-depth interviews (IDIs) with community partners and FEHNCY team members. More IDIs were conducted with Miawpukek community partners and focused on the community engagement approach in their context. The next part used a modified Talking Circle (mTC) with community partners in Kanehsatà:ke to confirm and clarify preliminary findings. For the last part, focus group discussions (FGDs) with FEHNCY team members were used to triangulate with the research team perspectives on cultural safety. The data generated included 26 IDIs in total: 14 interviews with community

Table 1 Summary of data collection methods and participants

Methods	In-depth interviews			Modified Talking Circle	Focus Group Discussions
Participant groups	Pilot communities Kanehsatà:ke community partners	Miawpukek community partners	FEHNCY team members	Pilot community Kanehsatà:ke community partners	FEHNCY team members
Compensation	\$50 per interview		Prize draw for \$30 gift item	\$75 per session	Prize draw for \$30 gift item per session
Date ranges	July 11, 2022 to January 23, 2023	April 24, 2023 to April 26, 2023	July 11, 2022 to January 23, 2023	February 8, 2023	April 4, 2023 & May 23, 2023
Sample size (n)	8	6	12	1 session; 4 participants	2 sessions; 12 participants & 7 participants
Sampling	Combination of criterion & theoretical sampling				
Recruitment	Email & Phone	Phone	Email	Email	Email
Eligibility	Experience working with the FEHNCY study and team			Experience working with the FEHNCY study and team	Assisted with FEHNCY data collection and/or engagement
Format	Virtual	In-person	Virtual	Virtual	Virtual
Duration	40–90 min			50 min	60 min
Topics	<ul style="list-style-type: none"> - Feedback on engagement activities - Relationship building with communities - Community contexts - FNs knowledge systems in research/cultural safety - Food sharing and traditional foods 			To confirm and clarify preliminary findings	To understand how to support cultural safety within the FEHNCY team

partners (with 4 follow-ups/repeat interviews) and 12 interviews with FEHNCY team members (with 2 follow-up/repeat interviews). Community partners included community leaders working across public sectors such as staff from the health center, housing and environment departments, schools and the band council, community members, community researchers and the CAC members. The FEHNCY research team consisted of staff and researchers such as principal investigators, coordinators, advisors, collaborators, and community researchers.

In-depth interviews

Semi-structured IDIs were conducted to understand community and research team perspectives of community engagement and ways to support KT. We recruited based on the method participants were responsive to (Table 1). Verbal consent was obtained before starting the interview. Semi-structured interviews were conducted with two sets of interview guides tailored to the roles and experiences of community partners and FEHNCY team members. Virtual interviews were done with community partners in Kanehsatà:ke following COVID-19 restrictions and time constraints. Virtual interviews were also done with the FEHNCY team members due to geographical constraints. Open-ended questions were followed by probes to understand the underlying processes of community engagement, cultural safety within FEHNCY and the pilot and their connections to KT [37]. Since we were in the middle of maintaining relationships with Kanehsatà:ke while analysis was ongoing and at the beginning of developing relationships and qualitative data collection in Miawpukek, we used conditional scenarios to encourage participants to express their understanding of community engagement and KT based on their experiences with the FEHNCY study thus far and outside the study as well. Interviews lasted between 40–90 min, with the exception of 1 interview lasting 25 min due to a scheduling conflict. Two participants requested to review their transcripts, and no changes were made for the first. Since the second participant did not like the way they described certain topics they decided to withdraw from the study. We respected their decision and withdrew their transcript from analysis and destroyed it. The sample size, recruitment and sampling methods, eligibility, interview topics, interview format and compensation for IDIs were listed in Table 1.

Follow-up interviews were conducted to deepen our understanding of how community engagement worked in Kanehsatà:ke and to support understanding of connections between concepts for theory development. Seven participants were recruited by email for follow-up interviews using theoretical sampling [37] or until specific gaps in the analysis of transcripts and topics were filled.

Modified talking circles

We used different methods depending on the participant group therefore, mTCs were used for community partners as it is an adapted Indigenous method for group discussion that is culturally appropriate, enhances trust and fosters mutual understanding and consensus decision-making [38–40]. The mTC was used as a member-checking session with community partners.

Focus group discussions

The FGDs were used to understand how culturally safe practices can be supported within the FEHNCY team and its connection to KT [41, 42]. This group interviewing method allowed for us to accommodate larger groups. The sample size, recruitment and sampling, eligibility, format, duration and compensation for group interviewing methods can be found in Table 1.

Analysis

Audio files from IDIs and mTCs were sent to a transcription service, transcribed verbatim and uploaded for analysis in Dedoose 9.0.107 [43]. We combined an inductive and deductive analysis to develop an evidence-based middle-range theory. The inductive coding approach was informed by Grounded Theory to uncover themes and relationships between themes that are grounded in a data set for theory development [37]. The deductive coding was informed by Realist Evaluation which can rigorously generate theories of complex interrelated social realities, reflected in the complex dynamics of relationship building and the diverse community contexts among Indigenous communities [30, 44–46].

The inductive coding steps included initial coding to develop themes and connect themes to one or more of the following deductive concepts: contexts, interventions, mechanisms and outcomes (CIMO), codebook refinement, and configuration development. Three transcripts were selected because they covered a range of CIMO topics of interest from the FEHNCY CEM. Line-by-line codes were developed based on in-vivo codes and gerunds to keep close to the data [37]. Line-by-line codes were then pile-sorted and were named by JW and BWJ to reflect the set of line-by-line codes in each pile. Codes were then assigned additional descriptors using a deductive approach to CIMO categories outlined by Pawson & Tilley [47, 48]. The refined codebook was then applied to the entire dataset. Through an iterative process of coding transcripts, memo-writing, and discussions between JW and BWJ, connections between codes were drawn and preliminary connections were refined with community partners and the same iterative process [49, 50]. Memos were written throughout in the form of free-writing initially and then cluster mapping [37]. Free-writing memos

were organized into the following categories: coding justifications, codebook changes, emerging patterns, CMO configurations, and gaps and questions [37]. New parent codes and/or child codes were developed to allow themes from the data to emerge inductively.

The CMO-logic or design proposition was suited for the objectives of this study to examine KT pathways that highlight what works (interventions), and in what circumstances (contexts), to produce which effects (outcomes) while providing explanations for why this happened (mechanisms) [51] as it supported the causal links between the rest of the CMO configuration [52]. The context provides background understanding that can facilitate or prevent mechanisms from being triggered. In this study, we used implementation science and realist evaluation definitions to describe community engagement strategies as the steps taken to outline how interventions can be implemented [53, 54]. The community engagement activities referred to the specific events that were done to apply strategies and achieve outcomes [48, 55]. The mechanisms describe the underlying processes that can explain how interventions connect to outcomes [56]. The outcomes are the program outputs [56].

Memo-ing and discussions allowed for continuous reflection on our positions in relation to this project, question our approaches and adapt when needed [37]. While all co-authors are a mix of Indigenous and non-Indigenous, the first author who led the analysis, Jolian Wong (JW) was raised in Montreal and is of Chinese descent from Hong Kong. JW was first introduced to the FEHNCY team and community members virtually in September of 2021 and her involvement is ongoing. Her graduate training was guided by her supervisor Brittany Wenniserí:iostha Jock (BWJ) who is a Kanien'kehà:ka (Mohawk) researcher with expertise in qualitative research and is one of the Principal Investigators who designed the FEHNCY's CEM approach. The remaining co-authors and their connections to this research can be found in the author contributions section.

Ethics

Once a community agreed to participate in the FEHNCY study and before proceeding with research in their community, each community finalized a Funding Transfer Agreement and Community Research Agreement (CRA) which described the partnership with the FEHNCY study team and includes how the Ownership, Control, Access and Possession (OCAP®) principles and community decision-making in the study are applied. Following the OCAP® principles and the CRA, participating communities and CAC members will possess a copy of the summary report of study findings and the First Nations Information Governance Centre

(FNIGC) will securely store a copy of this report and a copy of the anonymized FEHNCY data set from the community once they are ready. As a steward of the data, FNIGC will also be responsible for safeguarding the complete anonymized integrated data for FEHNCY. Both Miawpukek and Kanehsatà:ke CACs approved this research, provided feedback on preliminary findings with the research team, confirmed the final findings of the research and approved the use of their community's name in keeping with ownership, control and access principles of OCAP® and the CRA. Additional analysis using these data will require community approvals. As outlined in the CRA, community representatives endorsed the data management and storage procedures based on FEHNCY ethics approval. This study was approved by the Research Ethics Board (REB) of McGill University REB 4 (#22-01-020; PI: BWJ). All participants provided verbal consent before each data collection activity. To ensure participant confidentiality, we presented participant quotes without identifying their community.

Results

An overview of our results from the data produced, theorizes KT pathways within FNs communities in the form of an overarching CMO configuration and is visually depicted in Fig. 1. Participants described KT outcomes of the CMO configuration as community self-determination in research, improved research findings and application of results for FNs benefit. There were two mechanisms which were approaching community engagement as relational and valuing FNs knowledges. They each connected to KT outcomes in separate configurations, represented by individual arrows, but also reinforced each other as mechanisms, depicted by the double arrow. The essential engagement strategies that activated mechanisms were fostering community decision-making, Indigenous leadership, project visibility, youth-specific strategies and FNs knowledges, methodologies and cultures. The different contextual elements that interacted with essential engagement strategies, depicted by the double arrow, included the COVID-19 pandemic and the confirmed findings of Kamloops residential school, the FEHNCY study context and communities' history and experiences of colonization. Community partners and FEHNCY team members also described these KT pathways as a cyclical process that was sustained by the relational mechanism and valued FNs knowledges, represented by an arrow from KT outcomes to essential engagement strategies. We will be explaining each of these themes in the following sections of the results.

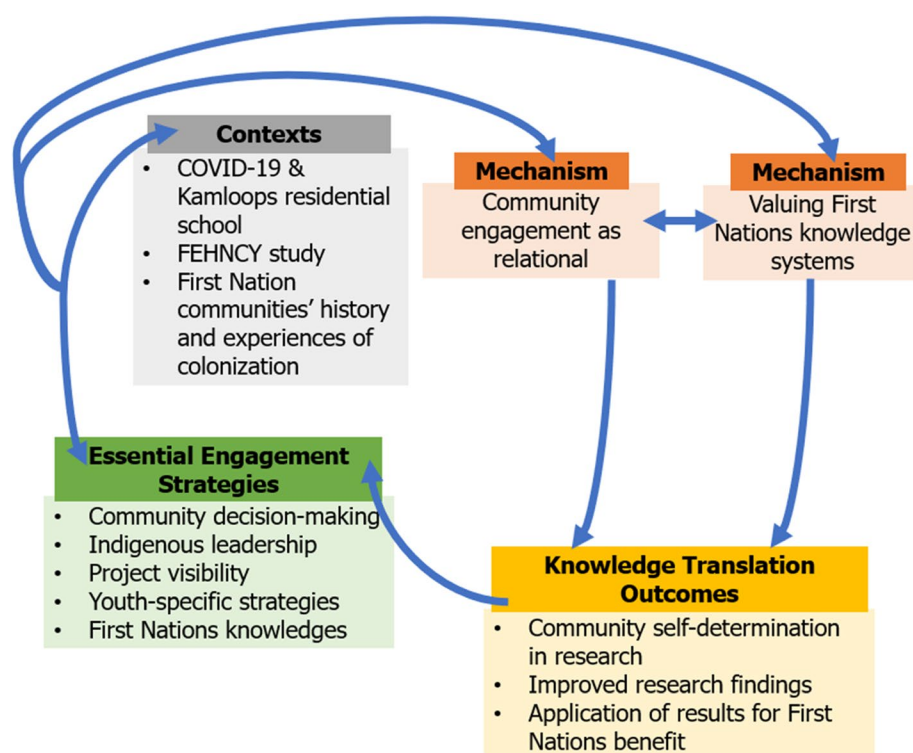


Fig. 1 KT pathways within FNs communities

KT outcomes

Participants described KT outcomes as community self-determination in research, improved research results and the application of results for the benefit of FNs communities.

Community self-determination in research

Participants highlighted the goal of decolonizing research was to reconcile historical ruptured relationships between Indigenous peoples and colonial settlers by establishing a different power dynamic that builds community capacity within the research. Community partners also connected valuing FNs knowledges as a mechanism to outcomes such as a strengthened sense of their identity as FN and healing experienced by community members involved in the research. A community partner explained FEHNCY research results contributed to decolonizing research efforts by re-enforcing knowledge of traditional practices,

"...the individual scientists didn't have a direct hand in colonization. But in working with us in this scientific aspects and in certain communities that are separated from our lands... bringing back some of our knowledge through a scientific approach... it's still a form of decolonization because we're relearning certain things, we're reconnecting. It's having a part in ...reconciliation." – Community partner

Some FEHNCY team and community partners connected the outcome of reconciling relationships with supporting community self-determination in research. A FEHNCY team member explained how current meaningful research partnerships reconcile past relationships and shape future relationships,

"Both [communities and research teams]... have that healing aspect of repairing past mistakes that weren't made by the study...But showing that there is that care, showing that both sides want that relationship ... You're setting the bar for how communities should be treated. And communities are setting the bar for how they want to be treated..." – FEHNCY team member

Improved research findings: scientific rigour and community-reflective results

Most community partners and FEHNCY team members identified better research findings as a result of working in relational ways and valuing FNs knowledges. FEHNCY team members and community partners described improved research findings by its representativeness and generalizability quantitative samples through survey participation while FEHNCY team members distinguished quantitative and qualitative measures of rigour. A community partner shared an example of an anticipated outcome of incorporating traditional foods (an engagement activity),

“They would get a lot more participants and the people will be more open and listening to the message that’s being sent out... It would rally up more people. Plus you can’t have an event without food in [our communities]...especially traditional food. Not just any food.” – Community partner

In addition to scientific rigour, both community partners and many FEHNCY team members described “better research” as useful data that could be used to bring change. However, community partners focused on community reflective results when describing the credibility of findings. A community partner contrasted scientific credibility with the process of communities extending credibility to the research results,

“[The research] could have the most credible data... scientifically because you followed every step of ... testing and the lab regulations were there. But for us, ... unless we were part of everything... to understand how it’s happening, why we’re doing it, that’s where the credibility comes in...versus you come in, I don’t really know what’s happening...But because we’re involved throughout the process, and we’re working collaboratively, we understand what’s happening, why we’re doing it. We’re taking that extra time to discuss things and make sure there’s a mutual understanding and then the results come about, and you’re like, ‘Yes, I understand that. I was part of it. I feel this is true. This is reflective.’” – Community partner

Both community partners and FEHNCY team members recognized that when the research process was based on a relational partnership and valued FNs knowledges, communities saw how the research results reflected their communities.

Application of results for the benefit of FNs communities

Participants recognized the importance of multiple levels of impact such as on individual, community and wider regional and national levels when applying research results, but most participants particularly emphasized the community level. Some community partners and FEHNCY team members described that research results were impactful for participating families and individuals because it increased their knowledge of health, nutrition, and the environment, how they could act on this knowledge and made links to health influences beyond the individual. A community partner shared about how individual behaviour or families were limited by a lack of income and affordability of healthier food options,

“I could look at a family and say, “...this is what their house looks like...there’s only one income here and

that’s all they’re getting.” Maybe they’re eating all this junk food because they can’t afford the real good stuff like milk because you got one income house. So, it ... makes you think like that. It changes your attitude...That questions [from the survey] ...brings that stuff out.” – Community partner

Many participants from the communities and FEHNCY team members described applying results for community benefit. Some participants highlighted that research results could inform community program planning. For example, a community partner suggested the use of research data and the CAC to mobilize community stakeholders to identify possible solutions,

“...[a] rep from the council, ...human resources,... a representative from the health centre, or education...[Youth] care about our, their future. They care about the community. Give them a voice to speak, and ways to take action... But let’s start with the committee. [FEHNCY has] very bright people, and well-intended people on our committee. Use that human resources to make things move.” – Community partner

Others emphasized communities being able to use the research data to apply for funding opportunities. Both community partners and FEHNCY team members described the cyclical nature of the KT pathways was relationally sustained and varied based on the needs of partners in the study. While some community and FEHNCY team members described the continuation of the research partnership through future avenues for advocacy at regional and national level policies and programs, applications at regional and national levels were not described as concretely as applications at the community level.

Mechanisms

Community engagement as relational

Participants described the process of working in relational ways as establishing, building and maintaining relationships between the FEHNCY research team and participating FNs communities. Participants’ description of this mechanism emphasized the significance of working relationally, the rippling effect of this mechanism on community engagement and the shared values required to build good relationships. When community partners expanded on the significance of relationships, many trace back to the pervasive impacts of colonialism and helicopter research within their community and Indigenous communities in general. The significance of community engagement in research was described by a community partner,

"I think it's important in our communities ...for [community engagement] to be relational. The relationship is really important between the people who are trying to engage the community, because so much has happened with different professions... that there's a lot of mistrust... when something is put out to the community... [it is difficult for community members to] trust that that will be beneficial or to trust that it will mean anything or make any change happen." – Community partner

Similarly, most participants from both the FEHNCY team and community emphasized the need to build relationships when conducting research with Indigenous Peoples. A FEHNCY team members pointed out relationships as the critical infrastructure for Indigenous health research,

"...when you're in [academia], you can apply for these infrastructure grants ... And it's big money, it'll buy you a big piece of equipment...Because certain research requires that kind of infrastructure, but really, [research with Indigenous peoples] ... need[s] relationships – that's the infrastructure for doing this kind of work...[and for] respecting how the community is going to express their self-determination, decision making power, their expertise and knowledge... It relies on that, building those kinds of relationships so that they can work together... when [that] infrastructure is not there, you're not going to have a research project..." – FEHNCY team member

All community partners and FEHNCY team members described the effect of positive and foundational relationships between the research team and community partners rippling through their kinship and social networks. Participants highlighted the important role of community champions and partners from the CAC who guided the research process and tapped into their community networks, which were pivotal for the recruitment of community members. The partnership between the research team and community partners supported a community governed research process that was defined as community-owned and community-driven. Many participants identified community ownership as an essential engagement strategy that shared decision-making with the CAC and supported Indigenous leadership within the research team. A community partner explained how community-driven research was shown through the CAC,

"... everything that's developed in terms of making things happen is worked in full collaboration between the research team and your community

partners and your participating champions... And it's how it was done at the Advisory Circle, [asking them] how do you think we should proceed? This is what [the research team is] thinking, what do you guys think? And then when there was some level of consensus, then that's how we proceeded... when we talk about driven, we're ... thinking metaphorically, driving, but there's a navigation aspect to your research too, and how we're going to go about it and that was done in full collaboration...your evidence is there in terms of being community driven."- Community partner

Not only did strong relationships between the research team and community partners ripple through their relationship with the community, FEHNCY team members also acknowledged strong relationships within the team having a rippling effect on relationships between the team and the community.

Most participants expressed the need for research teams to demonstrate reciprocity and trust resulting from this reciprocity. Participants also described trust as a building block in relationships and an ongoing process within the relationship. An example of how to build trust was through food sharing activities. The significance of gathering for a meal was described by a participant as showing trust towards the people gathered for the meal and as a door to sharing oneself,

"...When people gather for a meal we break bread together ... So they're more open, and listening, and in sharing, we share food. That way that opens the door to sharing ideas, to sharing feelings, to sharing stories ...And sharing your opinion...you're eating with these people, [s]o obviously you trust them...[so] it opens up the door...to share about what you know [and] what we think." – Community partner

Many participants described demonstrating the values of reciprocity and respect between the research team and the community were needed to build good relationships. A community member highlighted the importance of respect in relationships and the concept of being equal,

"Well you'll get support from people... If you show them respect, you're going to [get] respect back. But I mean if you're going to be talking down to your people, they're not going to listen to you or want anything to do with you..." – Community partner

Some community partners described that reciprocity was shown through the community benefits of the research. On an individual level, community partners and FEHNCY team members described reciprocity through the health information returned to individuals and culturally

appropriate gifts for community participation. A community partner identified reciprocity expressed through offering back to community members,

“Culturally...our worlds are created through our relationships...having that sort of give and take, not just approaching [participants] like they’re subjects... In the context of research...when we want information from a certain group. And...FEHNCY did a really good job in being reciprocal, in that something was offered back ...there’s a reciprocity that happens. And so there are gains on both sides, it’s not just taking from the people...” – Community partner

Valuing FNs knowledge systems

The FEHNCY team defined cultural safety as valuing FNs knowledge systems on par with western science. While both FEHNCY and community partners have been introduced to this term throughout meetings and discussions, both FEHNCY team members and community partners also expanded on valuing FNs knowledges as re-affirming FNs knowledges as equal to other knowledges, supporting communities’ expression of their culture and ways of doing and working in partnerships. While most participants described both mechanisms occurring simultaneously, valuing FNs knowledges was a mechanism that focused on how research teams created space for FNs cultures and worldviews within the research relationship. In a FGD, a FEHNCY team member shared about the importance of valuing FNs knowledges in research,

“Cultural safety is a vehicle...to make sure that collective agency can be expressed within the community... we make sure that they can express the research, express their goals. Is [the research done] in a way that they could take action upon their destiny or cultural system or food system... [it’s] very important ... as a researcher to take into account...where one community is [is different from another]...” – FEHNCY researcher

Most participants described valuing FNs knowledges being demonstrated when FNs knowledges were treated as equal to Western scientific knowledge. A community partner advocated for an equal regard for both knowledge systems,

“I think that as modern scientists coming in to value Indigenous knowledge is to... understand we call it Indigenous knowledge but it is scientific knowledge, it’s not like magic, it’s not mythical. Our people have lived with the land for so long, so in terms of knowledge it’s factual. Perhaps it was never documented and reported and peer reviewed, but it ... was in a way because oral transmission and peer reviewed in that

sense that ...when you look and you go across Turtle Island we share a lot of different medicines, we share a lot of different knowledge [with other nations]... So recognizing Indigenous knowledge as scientific knowledge I think goes a long way and promoting that and making it known to our people...you recognize its value, intrinsic value and worth.” – Community partners

Some FEHNCY team members also highlighted the differences in worldviews between Indigenous and scientific knowledge systems. Some community and FEHNCY team members explained having Indigenous leadership on the research team supported the bridging of different knowledge systems. A FEHNCY team member described Indigenous worldviews that are needed to bridge Indigenous knowledge systems in research,

“So for a scientist who is very observing of natural things, for them the world is observable and only the things that you can know are the things that you can see, that you can touch, that you can experiment with. But there’s other ways of seeing the world...The two-row wampum tell us that...where one is the settler and one is the ... Indigenous person, they can co-exist side-by-side, but when you do this, there’s going to be tensions... [but] we can co-exist with different world views ...” – FEHNCY team member

Additionally, both community partners and FEHNCY team members also expressed this mechanism as valuing the uniqueness of each community by following protocols and traditions when engaging with the community. A community partner connected supporting community ways of doing with a sense of ownership and leveling power differentials,

“... even in the process and in the way it was done... empowering us to figure out how to do this research and how it would be best for our community like that for me is also under ownership... in a cultural sense, ownership of the process... ownership of the power. Because research comes in and there’s a power differential... there’s experts... coming in to do research and then leaving ...so, I think when we think of ownership from a cultural sense, sharing of that power as well [and] not power over...— Community partner

Many community partners and FEHNCY team members described that valuing FNs knowledges was reinforced by working in relational ways. A FEHNCY participant explained how both mechanisms reinforced each other when talking about valuing FNs knowledges,

“...what I read often is that for Indigenous people is that the world is seen as relational – that it’s made up of relationships. And even as an individual...

we're not in relationships – we actually are the relationships that we hold. So if we think about a world, like that is understood as...we're in relationships with these things, relationships matter..." – FEHNCY team member

The processes of valuing FNs knowledges were built upon a solid relational foundation of trust, respect and reciprocity. At the same time, working relationally valued Indigenous understandings of the world through relationships.

Essential community engagement strategies and contextual interactions

Both community partners and FEHNCY team members described essential community engagement strategies that were done in the community and additional strategies that were seen as valuable. Community engagement strategies included supporting Indigenous leadership within the study, supporting community decision-making (with the CAC), promoting project visibility in communities, promoting youth-specific engagement, and incorporating FNs knowledges in research. These intervention strategies were significant given societal, study and community contexts. Since intervention strategies and the contexts interacted to activate mechanisms, we described contextual elements alongside the intervention strategies.

Supporting Indigenous leadership in research

Both community partners and FEHNCY team members highlighted that supporting Indigenous leadership within the FEHNCY team was essential to activate both mechanisms. Indigenous leadership at the core demonstrated the rippling effect of engagement and the bridging of FNs knowledge systems with research to achieve KT outcomes. When a community member was asked about their thoughts on FEHNCY's community engagement strategy, they pointed to the credibility of having Indigenous researchers on the team strengthening the relational accountability of the study,

"...The fact that there were Indigenous participation at the head of this project was very meaningful for myself as a community [member]... it made me feel like that there was a collaboration between community members of different communities... But it allowed me to meet new community members from other places and to feel supported in my community by other community members...and I think it's what allowed the success of this project having their presence and their lead on the project..." – Community partner

Considering the layered contexts beginning at the societal level with the confirmed findings of unmarked

graves at Kamloops, the sensitive nature of the FEHNCY research study topics and to the community level contexts namely, their experiences of pervasive impacts of colonisation and their relationships with research highlight how Indigenous leadership on the core research team was needed for communities to extend credibility and relational accountability to the study. A community member described community resilience within a colonial context, "[Apathy in communities is] a result of colonization, broken promises, a continued colonial approach...and it's very unhealthy in the environment that we're trying constantly, as best we can, to work through and heal and rebuild..."—Community partner.

Supporting community decision-making

Many community partners and FEHNCY team members described how FEHNCY supported community decision-making through establishing a CAC that guided the engagement strategy and the research process from the planning stages of the research in the recruitment, data collection and data analysis to data sharing and knowledge dissemination activities. A community partner explained the importance of these partnerships and the trust required in health research from FNs communities,

"I think that just the nature of the study itself can right on the onset have some barriers...because we're talking about very private information... I think people are a little bit guarded as to sharing about what they eat and talking about their personal physical health...So I think that the level of trust required to be built is much higher than if you're just inquiring about something a little bit more benign. But I think FEHNCY right off the bat with the notion that the project be community led is the first big step. So essentially you're not coming in as a big university...you're coming in, you establish partnerships." – Community partner

Participants identified the need for a wholistic engagement from the community including a diverse selection of CAC members to bring multiple perspectives to represent the community and bolster ways to mobilize within their roles. They described community members in different life stages such as grandparents/older adults, adults and youth, community partners from multiple sectors and the band council. Many FEHNCY team members also described team engagement activities that prompted individual and collective reflection on positioning their attitudes, positions and behaviours to encourage shared decision-making. Some examples were getting OCAP® training and the research team adopting a posture of responding and listening to the guidance given by the CAC. However, a FEHNCY team member

also raised an important consideration related to the capacity, “... the flip side of the coin is because we rely on the communities to tell us how to proceed... it takes a toll on the capacity... So this is something that can be challenging in some communities...” – FEHNCY team member.

Given societal contexts of the findings of unmarked graves at Kamloops, layered under the FEHNCY study context and community experiences of ongoing colonisation shaping their relationship with research, many participants identified supporting community decision-making as a significant strategy by establishing vital relationships to partner with the community in the research and follow communities’ practices and ways of doing. However, almost all participants identified the COVID-19 pandemic as an added layer of the societal context. Despite the pandemic amplifying the challenge of getting community participation in the research and engagement within a virtual study context, a few community partners highlighted that the prolonged research timeline due to the pandemic, strengthened relationships with the community while following the community’s timeline and capacity. A community partner described the impact of COVID-19 on participation,

“COVID was a gift for this project in our community because it stretched [the research] out longer. It made things a little bit slower...the way research is like cold, hard and fast...can have an effect on the outcome of participation and...willingness of community members while doing the actual interview.”
– Community partner

Promoting project visibility for community outreach

Many participants emphasized that promoting the visibility of the FEHNCY study in the community was vital for building trust to set foundations for relationships between the research team and the community. Considering the communities’ relationship with research, a community partner explained the importance of connecting project visibility to the outcomes,

“[The project]... need[s] to be more visible... if you have more people understanding your project, you have more of a buy-in from community members... But being invisible, forget it...we’re very used to having a lot of research...being shelved... [J]ust take an empty binder and put it up on the shelf next to the other projects...” – Community partner

In addition to supporting community decision-making, the CAC’s role in promoting the project visibility was highlighted by the pandemic which disabled researchers from going into communities, the communities’ relationships to research and the study collecting health information which

required forming trusting relationships. A community partner described the central role of the CAC and community partners in promoting the project visibility,

“...[There was work done on] establishing a bond [with the CAC] to be able to ensure participation [in the research] and to promote it [to community members]...So, [with the] Community Advisory Circles... everything was ... coming back to community members, some partners, some just community champions or interested parties, and you promote[d] that.”
– Community partner

Distinguishing youth-specific engagement strategies

Some participants distinguished youth engagement processes from adults by specifically designing activities that encourage relationship building with the youth, emphasizing existing community relationships with the youth while valuing FNs knowledges through engagement activities. Community partners described engaging with youth directly in youth spaces and providing “mentors” or “navigators” to guide the youth activities. Both community and FEHNCY team participants highlighted youth spaces as schools, youth centers and community centres for the implementation of in-person youth activities related to the study. A few FEHNCY and community partners identified the importance of incorporating an intergenerational aspect, as a valued trait of the communities’ knowledge. A community partner described it as building on the strengths of the different roles and relationships in the community,

“... the traditional teachings that we have ...we envision [the different life stages]... in a circle, because as we believe, life is circular... traditionally, each stage comes with a role and a responsibility...for youth... they’re looking to know who they are, their identity... to understand who they will become in the community, how they will contribute to the community...they challenge the adults, they challenge the status quo... [b]ecause they’re the future leaders and they’re there to push us and to question what works and to question and what doesn’t work.” – Community partner

Due to the pandemic, some FEHNCY team members and community partners explained that changes in capacity affected youth-specific engagement that could support relationship building with youth and the project visibility.

Incorporating FNs knowledges, methodologies, cultures and languages

Participants mentioned several examples of successful integration of FNs knowledge systems were having an opening/closing Ceremony with simultaneous

translations of a Nation's language, sharing traditional foods during a community-wide event, engaging local experts to make surveys more community-specific and seeking local FNs artists and youth to utilize FNs methods of KT (such as an artistic representation of each communities' message of health on a wampum bundle). A few community partners described the potential of using storytelling to bridge Indigenous and Western scientific knowledges. A community partner elaborated on using storytelling in the research to value Indigenous methodologies,

"...from an Indigenous perspective... storytelling... [has] been there through history [as] a way of passing knowledge...engaging with the actual conversation, instead of just having a questionnaire where they can answer yes or no...[community members] would elaborate a lot more with their knowledge through the process that they have of telling a story, if you can engage with them in that aspect." – Community partner

In light of community strengths within the described layers of the societal, study and community contexts, a community partner connected the remnant colonial impacts on Indigenous Peoples and cultures to additional effort that is required to be engaging in a relational way and valuing Indigenous knowledges in the research process with Indigenous communities,

"And if you look at our culture, ... it's very focused on responsibility... [a]nd if you look through colonization ...how did they try to assimilate us is to take our culture away ... they've separated us from [who we are]. So that has a lot of impact, socially, economically, on the side of health.... [I]n research... it has to be more focused on the responsibility of what you want to achieve as a researcher...in [our] Indigenous contexts, you're going to have to obviously put...a lot more effort than you would if it was in another context, because of that reality...." – Community partner

Discussion

This analysis combined deductive and inductive approaches from Realist Evaluation and grounded theory to articulate a middle-range theory summarizing KT pathways within FNs communities. The contextual factors such as the COVID-19 pandemic, the confirmed findings of unmarked graves at Kamloops residential school, the FEHNCY study and the communities' history and experiences of ongoing colonial impacts interacted with the essential community engagement strategies and activated mechanisms of approaching community

engagement as relational and valuing FNs knowledge systems for KT outcomes to occur among FNs. The theory developed from the results provides a higher level of abstraction beyond a program theory and, therefore, described a middle-range theory based on the data generated.

This research is the first to generate a middle-range theory supported by primary data on community engagement strategies interacting with multi-level contexts, and that describes the necessary mechanisms needed for the application of research findings. Both FEHNCY and community partners described relationship building between the research team and communities as an important foundation for conducting research with Indigenous peoples. Participants also described how to build trusting relationships and the significance of mirroring values of respect and reciprocity in the ongoing relationship within the KT pathways. They also elaborated on culturally safe practices that bridge the research to FNs knowledge systems, center communities' ways of doing and working in relationally partnerships. Similarly, a recent report by the NEIHR-Qc published, articulated ways of doing and knowing as a people and community centred approach and ways of being as relationship building, respect and reflexivity among others to create culturally safe research environments [33]. Previous research has highlighted trust being vital to a research process that supported community governance [4, 16–18, 20, 24, 25, 30, 57, 58] and reciprocal relationships with community champions [16, 18, 25, 58] which have been framed as mechanisms for participation outcomes in the literature [19]. In addition, trust has been central to the dissemination of health messages through family and community networks, policy, systems, and environmental changes [28]. A study examining the implementation of an evidence-based peer-education programme for Māori communities also found that relationships in their co-design and culturally grounded process in addition to autonomy and joint problem-solving were key themes that supported the adaptation and implementation of the programme [32]. These promising practices have been echoed in other health promotion intervention studies with American Indian, Alaskan Native and Native Hawaiian communities [9, 59, 60]. This research builds on these descriptions by describing the independence and interrelationship of mechanisms and connecting these vital mechanisms in the KT pathways towards a larger KT impact for FNs communities.

There has been little research designed to examine the processes of community engagement to achieve Indigenous KT. While most of the research published thus far has been anecdotal contributions to a successful implementation of community engagement processes and

potential mechanisms to achieve KT from the research team's perspectives, this research adds onto the few examples of primary data collected [4, 19, 57]. This research centers FNs perspectives and adds to existing KT literature as it connects the mechanism of approaching community engagement relationally through building trust and valuing reciprocity and respect for FNs community stakeholders to achieve KT outcomes. A previous study found that the use of an Advisory Circle structure as a community engagement activity [57] enabled building a partnership between a university and the community and was important to mobilize the community for KT to occur [57]. Similarly, our findings also highlight the vital role of a CAC in research partnerships that include a diverse representation of the community such as multi-sectoral community partners and community champions to establish community ownership in the research for KT. This analysis clearly demonstrates how the rippling effects of research partnerships that collaborate in relational ways support community decision-making in the community advisory structures. Future research could examine indicators that demonstrate achieving the mechanism of approaching community engagement relationally during the research process leading to KT.

Community partners and some FEHNCY team members described the second mechanism as valuing FNs knowledges in KT pathways. Some community partners linked this mechanism to the outcome of community self-determination in research. This mechanism was demonstrated by valuing FNs knowledges as equal to Western scientific knowledge, supporting communities' expression of their cultural ways of doing and working in partnership with communities. Findings in this study align with previous studies that have described cultural safety practices as creating space for the sharing of local Indigenous culture [16, 19, 22, 40, 58] and bridging Indigenous knowledges in western research [9, 18, 20, 22, 24, 25, 59, 60]. Moreover, cultural safety has been postulated as a mechanism in Indigenous health research literature [5, 16–20, 22, 24, 25, 40, 58] but how cultural safety acts as a mechanism in KT pathways has yet to be explained. Genuine relationship development and collaborative partnerships has previously been connected with cultural safety, creating a safe space for Indigenous peoples to express their needs and aspirations [33]. This analysis continues to build on these previous works by adding to the qualitative data generated, demonstrating how the mechanism of cultural safety (valuing Indigenous knowledge systems) is essential in the KT pathways. In addition, this study also adds to the literature by presenting primary data that highlights the interconnection between valuing Indigenous knowledges and working relationally that need to be activated for Indigenous KT to occur.

Future research should examine developing implementation scales to refine the mechanisms in KT pathways within Indigenous contexts.

The results of this research highlight a CIMO configuration that has emerged based on primary data (Fig. 1). Some researchers such as Smylie et al., who have started examining KT in Indigenous health research, connected historical and ongoing colonial contexts to the mechanism of community ownership in programs and multi-level outcomes, including improved health indicators, behaviour changes and cultural practices [30]. Similarly, in this study, given the historical and colonial impacts on Indigenous communities' relationship with research, the community engagement strategy of supporting community decision-making through the CAC and researcher reflexivity activated the relational mechanism in the KT pathways. The research partnership in the context described and supported by community engagement contributed to community governance and ownership of the research process. Mechanisms found in this study were connected to outcomes such as community self-determination in research, improved scientific results and community-reflective research and the application of results for FNs benefit. Although the CIMO configuration from this study is supported by findings from Smylie et al. [30], this study took a more focused analysis on the connections between community engagement to KT. This study also puts forward a middle-range theory which provides a higher level of abstraction and articulates a CIMO configuration grounded closely in the data.

Moreover, a systematic review by Ninomiya et al. that highlighted promising practices for KT reported on community engagement processes that supported community decision-making, incorporated Indigenous knowledges and supported Indigenous leadership in the research teams. These engagement processes could activate effective approaches for desired KT outcomes such as the meaningful involvement of stakeholders, following Indigenous practices and protocols and communicating culturally relevant knowledges [23]. Ninomiya et al. gave an example of an application of the relational mechanism by demonstrating researcher accountability in building on kinship and social networks and showing reciprocity [23]. Although there was minimal contextual influence reported other than the program contexts, they linked mechanisms to health and wellness outcomes such as capacity building in awareness of health among community members, health care practices, new programs and reinforced self-determination [23]. In contrast, the CIMO configuration in this study captured the impact of contextual interactions on the interventions, mechanisms and outcomes. Findings from Ninomiya et al. also support our findings on community engagement strategies

that promote community decision-making and Indigenous leadership within the research team. Ninomiya et al. added to the literature as they have rigorously summarized current KT approaches used, the effectiveness of KT efforts and recommendations based on their systematic review [23]. While the community engagement intervention and mechanisms are not well delineated within their study, the methodology in our analysis enabled our findings to refine these links highlighting community engagement strategies that activated interconnected mechanisms of relationship building and cultural safety. In addition to multi-level health outcomes that were supported in both, our findings build on Ninomiya et al.'s study [23] by filling the gaps in the mechanisms that connected to effective KT outcomes ranging from community self-determination in research to improved research findings and the application of results for the benefit of FNs in this study.

Key findings from this study on working in relational ways and valuing Indigenous knowledge systems have been supported in previous literature and extends the importance of these vital mechanisms in research partnerships with Indigenous communities for KT outcomes. Future research should evaluate long-term KT outcomes that results from working in relational ways and valuing Indigenous knowledges in Indigenous research partnerships.

Strengths & limitations

A standard reporting criterion was used based on Lincoln & Guba for qualitative research and Pawson's rigour criteria for realist evaluation in keeping with the specificity for reporting standards [61–63]. The proposed research had important strengths. First, audit trails of the research process and researcher reflexivity were documented using memo-writing and fieldnotes to increase the dependability and transparency of the research [62, 63]. Second, JW's prolonged engagement in the FEHNCY study, the CEM team, and in the communities enhanced the credibility of findings [61]. Third, the CAC played an active role in member checking through discussion of preliminary results to strengthen the credibility [61] and propriety of findings [62, 63]. Fourth, triangulation of participants and methods supported the improved credibility of our findings [61], the purposivity and utility [62, 63] by including different participant groups to account for multiple stakeholder perspectives and combining IDIs and mTCs/FGDs. Fifth, data collection was conducted in two FNs communities which enhanced the transferability of our findings to other communities [61]. The two communities differed in geographical contexts (rural and semi-urban), host community organisation, and community relationships with research which enabled cross-comparisons between communities. Sixth,

considering the diversity of participating communities, we have focused on intervention strategies rather than activities to center meaningful engagement rather than a prescriptive approach to community engagement, addressing the specificity of this research as a strength [62, 63]. In recognizing differing community contexts and the level of abstraction that we were able to achieve, we propose a middle-range theory that provides a higher level of conceptual abstraction based on Pawson & Tilley's definition of the middle-range as a level between everyday implementation and high-level policy systematic efforts to explain observed patterns of a social phenomena [48]. Readers should review the community descriptions and contextual factors to assess whether our findings transfer to their contexts. Lastly, we applied a strengths-based approach from the design of the guide to the sharing of these findings while considering the sensitivity of speaking negatively about the topic and its social desirability which has reinforced the propriety of results [62, 63]. In addition to having JW lead the recruitment, data generation and analysis as BWJ's graduate student rather than BWJ, we triangulated by gathering a range of experiences from FEHNCY team members and community members representing expected and unexpected results. We incorporated interviewing techniques such as conditional scenarios and asked participants about the challenges related to community engagement. These findings served to emphasize engagement strategies that were essential wherein their absence, the mechanisms would not be activated nor the necessary underlying mechanisms that connected with KT outcomes, further enhancing the utility and accuracy [62, 63].

This research also has limitations to consider. First, given the timeframe of the FEHNCY study in the community, we are unable to observe the long-term KT outcomes since we would need more time to examine policy changes, as an example. Therefore, this current study has collected empirical data that focus on vital mechanisms and supporting essential community engagement strategies for short-term KT impacts needed to achieve longer-term KT outcomes. Future research can focus on refining the current middle-range theory for long-term policy changes and transformation that develop over time. Second, FGDs were used instead of mTCs with the FEHNCY researchers and staff to accommodate time constraints. While this changed the data collection method, it allowed for a more focused discussion on topics that were outlined by the facilitator [64]. Third, both Indigenous and non-Indigenous team members, researchers and staff attended the FGD which could have influenced participant responses. It was vital to include Indigenous researchers who also led the FEHNCY CEM, because the topic focused on cultural

safety within the research team and activities supporting this. We managed these dynamics by providing our rationale for their attendance, re-iterating the purpose of the FGD at the beginning of each session, having each Indigenous researcher attend one of the two FGDs to allow for comparison of their respective presence and giving silent participants the chance to express their perspectives before moving to the next topic. Fourth, since the FEHNCY team defined cultural safety with FEHNCY team members and used this definition to foster accessible discussions around this topic with community partner participants, we were not able to ask about this topic in a more open-ended way. Further, due to the research question and methods design, we identified FEHNCY team member participants based on their knowledge of cultural safety and connections to KT. However, culturally safe research practices need to be practiced by each research team member and future research should consider how cultural safety is operationalized and practiced by all research team members throughout a research study. Fifth, the COVID-19 pandemic limited in-person activities and therefore, activities sharing traditional foods as well. Although we tried to include traditional foods for in-person engagement activities, the data generated was also based on community partners' knowledge of their communities and how it has impacted community engagement. Sixth, data collection via Zoom was done to protect participants in Kanehsatà:ke from COVID-19. While virtual interviews limited our ability to build rapport with participants, we were able to assess non-verbal cues through video. Moreover, FEHNCY's relationship with community partners and JW's prolonged engagement with community partners contributed to building rapport prior to interviews and provided a safe space for participants to share their perspectives comfortably. Seventh, due to limited availability for a meeting time with Miawpukek, a mTC to confirm findings was not done as a formal data collection activity. This was mitigated by confirming research results with Miawpukek during a CAC rather than a formal data collection activity outside of the regular CAC meetings.

Conclusion

This research fills an important gap by contributing to an evidence-based theory that underpins ethical research practices and can result in research promoting shared action among FNs communities. This study builds on the existing discussions and research developments [4, 5, 9, 15–29, 31–33, 36, 40, 57–60, 65] and used a novel methodology combining inductive and deductive approaches to put forward a middle-range theory outlining how community engagement and cultural safety support KT based on

primary data collection. This middle-range theory offers a first strengths-based conceptualization of the unique contexts and engagement strategies that different groups highlighted as essential when conducting health research with FNs communities and places relational and culturally safe processes at the forefront as necessary mechanisms for KT outcomes to occur. Community engagement and cultural safety have been reported in the literature as vital for partnerships and research with Indigenous communities globally and require researchers to engage with Indigenous communities according to policy documents such as the UNDRIP and the Tri-council Policy Statement. Similarly, KT is a fundamental mandate adopted nationally by CIHR and continues to be recognized among research institutions internationally. The middle-range theory developed from this research can contribute to improved research practices and policies that support advancing health equity for Indigenous Peoples.

Abbreviations

KT	Knowledge Translation
FEHNCY	Food, Environment, Health and Nutrition of First Nations Children and Youth
FN	First Nation
CEM	Community Engagement and Mobilization
CIHR	Canadian Institutes of Health Research
CBPR	Community-Based Participatory Research
TCPS	Tri-Council Policy Statement
CFIR	Consolidated Framework for Implementation Research
UNDRIP	United Nations Declaration on the Rights of Indigenous Peoples
CAC	Community Advisory Circle
IDI	In-depth Interview
mTC	Modified Talking Circle
FGD	Focus Group Discussion
CIMO	Context, Intervention, Mechanism and Outcome
CRA	Community Research Agreement
OCAP®	Ownership, Control, Access and Possession
FNIGC	First Nations Information Governance Centre
REB	Research Ethics Board

Acknowledgements

The authors acknowledge the vital role of participating First Nations communities namely Kanehsatà:ke and Miawpukek First Nations, and community partners who were essential to this study. Both CACs from Kanehsatà:ke and Miawpukek provided their approval for this research and provided guidance as the research was being conducted, analyzed, and shared. We extend special recognition to Ada John, Mindy John, Mary Stride and Les Benoit for suggesting additional edits to the community description. We are also thankful for the collaboration of all members in the FEHNCY research team (including Principal Investigators: Dr. Malek Batal, Dr. Tonio Sadik, Dr. Mélanie Lemire, Dr. Jiping Zhu, Dr. Tom Kovesi, Dr. Mylène Riva, Dr. Geneviève Mercille, Irving Leblanc, Dr. Richard Bélanger & Dr. Pierre Ayotte and the research staff: Lynn Barwin, Amy Ing, Milena Nardocci-Fusco, Katlyn Belanger-Donovan, Victor Odele, Élisabeth Gagné, Rhiannon Ng, Alexandrine Roy & Ariane Lafortune), Revathi Sahajpal, who assisted with note-taking for modified Talking Circles and helped with scheduling some Advisory Circles and finally, FEHNCY's community engagement liaison, Tess Lalonde, who assisted with communicating and recruiting Advisory Circle members in participating communities.

Authors' contributions

The authors' responsibilities were as follows: 1. Jolian Wong (JW). JW assisted with ethics board applications and led the development of the manuscript adapted from her thesis. JW conducted and drafted the literature review and discussion, informed the refinement of the research question, contributed to the data collection guide development, conducted all data collection (i.e.,

data generation), led the coding and analysis, supported engagement, and wrote the thesis and manuscript. 2. Dr. Treena Wasontio Delormier (TWD). TWD is Kanien'kehà:ka from Kahnawake Mohawk Territory. She is an Associate Professor in the School of Human Nutrition, McGill University and does collaborative health promotion research with Indigenous communities. She is a thesis committee member who co-developed the initial program theory and contributed to the strategic planning of engagement activities. She provided feedback on the research design, the refinement of data analysis and the process for getting community approvals for dissemination. She also provided feedback on the initial thesis proposal and significantly contributed to refining the literature review and discussion of the final thesis. 3. Dr. Dave Bergeron (DB). DB is a non-Indigenous researcher who lives and works on the traditional territory of the Wolastoqiyik Wampanoag First Nation with expertise in realist approaches with Indigenous peoples. DB is an external thesis committee member who co-developed the analysis methodology with Dr. Jock, contributed to the write-up of the methods, significantly contributed to the rigor requirements used in the discussion and provided feedback for refining drafts of the thesis and manuscript. 4. Hing Man Chan (HMC). HMC is a non-Indigenous researcher who has worked with over 100 Indigenous communities on environmental health issues in the last 30 years and was the nominated Principal Investigator of the FEHNCY pilot. HMC provided supervision and support of the overall study components of FEHNCY including the concept of the central role of CEM in FEHNCY. He has significantly contributed to establishing and developing relationships with community partners which has facilitated the creation of CACs who have been essential partners in this study and provided feedback to the final manuscript. 5. Pamela Gabriel-Ferland (PGF). PGF has been a community social worker for more than 20 years, working with an approach that blends her Kanien'kehà:ka culture with her Western academic training. Her role and contribution to this project has been as a CAC member, and to share her knowledge on Indigenous wellness and social development. PGF provided both verbal and written feedback and revisions on the results. She has significantly contributed to the community description sections by providing essential expertise on historical clarifications and revisions grounded in her cultural knowledge and worldview. 6. Dr. Brittany Wenniser-Iostha Jock (BWJ). BWJ is the thesis supervisor, led the oversight of ethics approvals and compliance for the project, co-developed the initial program theory for FEHNCY's CEM, designed the research methodology and methods and contributed to the analysis and interpretation of findings. She has provided significant contribution to writing through multiple rounds of revisions from the initial drafts to the final thesis and manuscript. She also has essential academic expertise and guidance from Indigenous worldviews.

Funding

The FEHNCY research was funded by Indigenous Services Canada (1920-HQ-000017). TWD and HMC are funded by the Canada Research Chairs Program in Indigenous Food Security and Nutrition (TWD: CRC- 950–232179) and Toxicology and Environmental Health (HMC: CRC-2017–00179), respectively.

Data availability

The qualitative data sets generated and analyzed during the current study are not publicly available due to the risk of identifying participants and to protect participant confidentiality. However, this study follows the principles of OCAP® (Ownership, Control, Access and Possession) and as such, community approvals would be required to access the data from this study.

Declarations

Ethics approval and consent to participate

All participants provided informed verbal consent before each data collection activity. This research was conducted in accordance with the Declaration of Helsinki and the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans [12]. Ethics approval was obtained through the Research Ethics Board at McGill University (#22–01–020) and the University of Ottawa Research Ethics Board (H-09–19-4741).

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

¹Department of Family Medicine, McGill University, Montreal, Canada. ²School of Human Nutrition, McGill University, Montreal, Canada. ³Department of Health Sciences, Université du Québec À Rimouski, Rimouski, Canada. ⁴Department of Biology, University of Ottawa, Ottawa, Canada. ⁵Kanehsatàke, Canada.

Received: 12 March 2024 Accepted: 4 March 2025

Published online: 02 April 2025

References

- Canadian Institutes of Health Research (CIHR). Evaluation of CIHR's knowledge translation funding program. Available from: <http://www.cihr-irsc.gc.ca/e/47332.html>. Cited 2023 Nov 20
- Government of Canada. Consolidation of Constitution Act, 1867 to 1982. Available from: https://laws-lois.justice.gc.ca/eng/Const/Const_index.html. Cited 2023 Nov 20
- Statistics Canada. Aboriginal Peoples in Canada: First Nations People, Métis and Inuit. 2011. Available from: <https://www12.statcan.gc.ca/nhs-enm/2011/as-sa/99-011-x/99-011-x2011001-eng.cfm>. Cited 2023 Nov 20
- Smylie J, Kaplan-Myrth N, McShane K, Métis Nation of Ontario-Ottawa Council, Pikwakanagan First Nation, Tungasuvvingat Inuit Family Resource Centre. Indigenous knowledge translation: Baseline findings in a qualitative study of the pathways of health knowledge in three indigenous communities in Canada. *Health Promot Pract*. 2009;10(3):436–446. Available from: <https://pubmed.ncbi.nlm.nih.gov/18281419/>. <https://doi.org/10.1177/1524839907307993>
- Smylie J, Martin CM, Kaplan-Myrth N, Steele L, Tait C, Hogg W. Knowledge translation and indigenous knowledge. *Int J Circumpolar Health*. 2004;63 Suppl 2:139–143. Available from: <https://pubmed.ncbi.nlm.nih.gov/15736639/>. <https://doi.org/10.3402/ijch.v63i0.17877>
- Minkler M, Wallerstein N. Community-based participatory research for health: From process to outcomes. San Francisco (CA): Wiley; 2008.
- Simonds VW, Christopher S. Adapting Western research methods to indigenous ways of knowing. *Am J Public Health*. 2013;103(12):2185–2192. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3828951/>. <https://doi.org/10.2105/AJPH.2012.301157>
- Smith LT. Decolonizing methodologies. 2nd ed. London (UK): Zed Books; 2012.
- Jernigan VB, D'Amico EJ, Kaholokula JK. Prevention research with Indigenous communities to expedite dissemination and implementation efforts. *Prev Sci*. 2020;21:74–82. Available from: <https://pubmed.ncbi.nlm.nih.gov/30284158/>
- Dussault R, Erasmus G. Report of the royal commission on Aboriginal peoples. 1996. Available from: <https://qspace.library.queensu.ca/handle/1974/6874>. Cited 2023 Nov 20
- United Nations. United Nations declaration on the rights of Indigenous peoples. 2007. Available from: https://www.un.org/development/desa/indigenouspeoples/wp-content/uploads/sites/19/2018/11/UNDRIP_E_web.pdf. Cited 2023 Nov 20
- Canadian Institutes of Health Research (CIHR), Natural Sciences and Engineering Research Council of Canada (NSERC), and Social Sciences and Humanities Research Council of Canada (SSHRC). Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans. 2018. Available from: <https://ethics.gc.ca/eng/documents/tcps2-2018-en-inter-active-final.pdf>. Cited 2023 Nov 20
- Banks N. The duty to consult in Canada Post-Haida Nation. *Arct Rev Law Polit*. 2020;11:256–279. Available from: <https://www.jstor.org/stable/48710633>.
- Truth and Reconciliation Commission of Canada. Calls to Action [document on the internet]. Available from: https://www2.gov.bc.ca/assets/gov/british-columbians-our-governments/indigenous-people/aboriginal-peoples-documents/calls_to_action_english2.pdf. Cited 2023 Nov 20
- White T, Murphy K, Branje K, McKibbin S, Cunsolo A, Latimer M, McMillan J, Sylliboy J, Martin D. How has Indigenous health research changed in Atlantic Canada over two decades? A scoping review from 2001 to 2020. *Soc Sci Med*. 2021;279:113947. Available from: <https://pubmed.ncbi.nlm.nih.gov/33991791/>. <https://doi.org/10.1016/j.socscimed.2021.113947>
- Peake RM, Jackson D, Lea J, Usher K. Meaningful Engagement With Aboriginal Communities Using Participatory Action Research to Develop Culturally Appropriate Health Resources. *J Transcult Nurs*.

- 2021;32(2):129–136. Available from: <https://pubmed.ncbi.nlm.nih.gov/31948353/>. <https://doi.org/10.1177/1043659620949336>
17. Parker E, Meiklejohn B, Patterson C, Edwards K, Preece C, Shuter P, Gould T. Our games our health: A cultural asset for promoting health in indigenous communities. *Health Promot J Aust*. 2006;17(2):103–108. Available from: <https://pubmed.ncbi.nlm.nih.gov/16916312/>. <https://doi.org/10.1071/HE06103>
18. Kholghi MK, Bartlett G, Phillips M, Salsberg J, McComber AM, Macaulay AC. Evaluating an Indigenous health curriculum for diabetes prevention: Engaging the community through talking circles and knowledge translation of results. *Fam Pract*. 2018;35(1):80–87. Available from: <https://pubmed.ncbi.nlm.nih.gov/28985385/>. <https://doi.org/10.1093/fampra/cmx086>
19. Thurber KA, Olsen A, Guthrie J, McCormick R, Hunter A, Jones R, Maher B, Banwell C, Jones R, Calabria B, Lovett R. "Telling our story... Creating our own history": Caregivers' reasons for participating in an Australian longitudinal study of Indigenous children. *Int J Equity Health*. 2018;17(1):143. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6138915/>. <https://doi.org/10.1186/s12939-018-0855-3>
20. Fisher PA, Ball TJ. Tribal participatory research: Mechanisms of a collaborative model. *Am J Community Psychol*. 2003;32(3–4):207–216. Available from: <https://pubmed.ncbi.nlm.nih.gov/14703257/>, <https://doi.org/10.1023/B:AJCP.0000004742.39858.c5>
21. Beckett MK, Hafford-Letchfield T, Phillips J. Building relationships for health equity: a review of the literature on community-academic partnerships in health promotion. *Prev Sci*. 2017;18(4):500–511. Available from: <https://pmc.ncbi.nlm.nih.gov/articles/PMC5955773/>
22. Rasmus SM. Indigenizing CBPR: Evaluation of a community-based and participatory research process implementation of the Elluum Tungii-nun (towards wellness) program in Alaska. *Am J Community Psychol*. 2014;54(1–2):170–179. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4119544/>. <https://doi.org/10.1007/s10464-014-9653-3>
23. Morton Ninomiya ME, Maddox R, Brascoupe S, Robinson N, Atkinson D, Firestone M, Ziegler C, Smylie J. Knowledge translation approaches and practices in Indigenous health research: A systematic review. *Soc Sci Med*. 2022;301:114898. Available from: <https://pubmed.ncbi.nlm.nih.gov/35504232/>. <https://doi.org/10.1016/j.socscimed.2022.114898>
24. Oosman S, Nisbet C, Smith L, Abonyi S. Health promotion interventions supporting Indigenous healthy ageing: A scoping review. *Int J Circumpolar Health*. 2021;80(1). Available from: <https://pubmed.ncbi.nlm.nih.gov/34313553/>. <https://doi.org/10.1080/22423982.2021.1950391>
25. Delafield R, Hermosura AN, Ing CT, Hughes CK, Palakiko DM, Dillard A, Kekaouha BP, Yoshimura SR, Gamiao S, Kaholokula JK. A Community-Based Participatory Research Guided Model for the Dissemination of Evidence-Based Interventions. *Prog Community Health Partnersh*. 2016;10(4):585–595. Available from: <https://pubmed.ncbi.nlm.nih.gov/28569684/>. <https://doi.org/10.1353/cpr.2016.0067>
26. Quigley R, Russell SG, Sagigi BR, Miller G, Strivens E. Community involvement to maximise research success in Torres Strait Islander populations: More than just ticking the boxes. *Rural Remote Health*. 2021;21(3):5957. Available from: <https://www.rrh.org.au/journal/article/5957>. <https://doi.org/10.22605/RRH5957>
27. Gwynn J, Sim K, Searle T, Senior A, Lee A, Brimblecombe J. Effect of nutrition interventions on diet-related and health outcomes of Aboriginal and Torres Strait Islander Australians: A systematic review. *BMJ*. 2019;9(4):e025291. Available from: <https://bmjopen.bmj.com/content/9/4/e025291>. <https://doi.org/10.1136/bmjopen-2018-025291>
28. Jock BW, Maudrie T, Fleischhacker S, Porter KP, Gittelsohn J. Journey to Promoting Structural Change for Chronic Disease Prevention: Examining the Processes for Developing Policy, Systems, and Environmental Supports in Native American Nations. *Curr Dev Nutr*. 2022;6(3). Available from: <https://pubmed.ncbi.nlm.nih.gov/35310617/>. <https://doi.org/10.1093/cdn/nzab031>
29. Jernigan VB, D'Amico EJ, Duran B, Buchwald D. Multilevel and community-level interventions with Native Americans: challenges and opportunities. *Prev Sci*. 2020;21:65–73. Available from: <https://pmc.ncbi.nlm.nih.gov/articles/PMC6275139/>
30. Smylie J, Kirst M, McShane K, Firestone M, Wolfe S, O'Campo P. Understanding the role of Indigenous community participation in Indigenous prenatal and infant-toddler health promotion programs in Canada: A realist review. *Soc Sci Med*. 2016;150:128–143. Available from: <https://pubmed.ncbi.nlm.nih.gov/26745867/>. <https://doi.org/10.1016/j.socscimed.2015.12.019>
31. Cargo M, Mercer SL. The value and challenges of participatory research: strengthening its practice. *Annu Rev Public Health*. 2008;29:325–50. Available from: <https://pubmed.ncbi.nlm.nih.gov/18173388/>. <https://doi.org/10.1146/annurev.publhealth.29.091307.083824>
32. Simpson ML, Ruru S, Oetzel J, Meha P, Nock S, Holmes K, Adams H, Akapita N, Clark M, Ngaia K, Moses R, Reddy R, Hokowhitu B. Adaptation and implementation processes of a culture-centred community-based peer education-programme for older Māori. *Implement Sci Commun*. 2022;3:123. Available from: <https://implementationsciencecomms.biomedcentral.com/articles/https://doi.org/10.1186/s43058-022-00374-3>. <https://doi.org/10.1186/s43058-022-00374-3>
33. Blackburn, M., Gravel, A., Monette-Deschenes, A., Qashu, L. & Bisset, S. (2024, June). *Cultural Safety in an Indigenous Health Research Context*. https://www.mcgill.ca/familymed/files/familymed/cultural_safety_report_en_-_final.pdf
34. Shearn K, Allmark P, Piercy H, Hirst J. Building realist program theory for large complex and messy interventions. *Int J Qual Methods*. 2017;16(1). Available from: https://www.researchgate.net/publication/321378401_Building_Realist_Program_Theory_for_Large_Complex_and_Messy_Interventions. <https://doi.org/10.1177/1609406917741796>
35. Wilson S. Research is Ceremony: Indigenous research methods. Black Point (NS): Fernwood Publishing; 2008.
36. Samiajiz Miawpukek Tables and Charts [Internet]. Newfoundland & Labrador, Canada:Newfoundland & Labrador Community Accounts; (n.d.; cited 2024 July 2). Available: https://nl.communityaccounts.ca/profiles.asp?_vb7En4WVgaauzXFmWQ__
37. Charmaz K. Constructing grounded theory: A practical guide through qualitative analysis. London (UK): SAGE Publications Inc; 2006.
38. Brown MA, Di Lallo S. Talking Circles: A Culturally Responsive Evaluation Practice. *Am J Eval*. 2020;41(3):367–383. Available from: https://www.researchgate.net/publication/342080605_Talking_Circles_A_Culturally_Responsive_Evaluation_Practice. <https://doi.org/10.1177/1098214019899164>
39. Fleischhacker S, Vu M, Ries A, McPhail A. Engaging Tribal Leaders in an American Indian Healthy Eating Project Through Modified Talking Circles. *Family Community Health*. 2011;34(3):202–210. Available from: <https://pubmed.ncbi.nlm.nih.gov/21633212/>. <https://doi.org/10.1097/FCH.0b013e31821960bb>
40. Browne AJ, Varcoe C, Lavoie J, Smye V, Wong ST, Krause M, Tu D, Godwin O, Khan K, Fridkin A. Enhancing health care equity with Indigenous populations: evidence-based strategies from an ethnographic study. *BMC Health Serv Res*. 2016;16:544. Available from: <https://bmchealthservres.biomedcentral.com/articles/https://doi.org/10.1186/s12913-016-1707-9>. <https://doi.org/10.1186/s12913-016-1707-9>
41. Lange JK. Review: Richard A. Krueger & Mary Anne Casey (2000). *Focus Groups. A Practical Guide for Applied Research* (3rd edition). FQS. 2002 Nov. 30 ;3(4). Available from: <https://www.qualitative-research.net/index.php/fqs/article/view/791>. Cited 2024 Jul. 2
42. Then K, Rankin JA, Ali E. Focus Group Research: What Is It and How Can It Be Used? *Can J Cardiovasc Nurs*. 2014;24(1):16–22. Available from: <https://pubmed.ncbi.nlm.nih.gov/24660275/>.
43. Dedoose Version 9.0.107. Dedoose. Available from: www.dedoose.com. Cited 2023 Nov 20
44. Bergeron DA, Tremblay M, Dogba MJ, Martin D, McGavock J. The Use of Realist Approaches for Health Research in Indigenous Communities. *AlterNative*. 2021;17(1):106–110. Available from: https://www.researchgate.net/publication/349463200_The_use_of_realist_approaches_for_health_research_in_indigenous_communities. <https://doi.org/10.1177/1177180121996063>
45. Jagosh J, Bush PL, Salsberg J, Macaulay AC, Greenhalgh T, Wong G, Cargo M, Green LW, Herbert CP, Pluye P. A realist evaluation of community-based participatory research: Partnership synergy, trust building and related ripple effects. *BMC Public Health*. 2015;15:725. Available from: <https://bmcpubhealth.biomedcentral.com/articles/https://doi.org/10.1186/s12889-015-1949-1>. <https://doi.org/10.1186/s12889-015-1949-1>
46. Gilmore B, McAuliffe E, Power J, Vallières F. Data Analysis and Synthesis Within a Realist Evaluation: Toward More Transparent Methodological Approaches. *Int J Qual Methods*. 2019;18. Available from: <https://journals.sagepub.com/doi/full/https://doi.org/10.1177/1609406919859754>. <https://doi.org/10.1177/1609406919859754>

47. Pawson R, Greenhalgh T, Harvey G, Walshe K. Realist Synthesis: An Introduction. ESRC RMP. 2004. Available from: https://www.researchgate.net/publication/228855827_Realist_Synthesis_An_Introduction.
48. Chelimsky E, Shadish WR, editors. Evaluation for the 21st Century: A Handbook [Internet]. Sage Publications Inc; 1997. Chapter 29, An introduction to scientific realist evaluation. [cited 2025 Mar 19]. Available from: <https://methods.sagepub.com/hnbk/edvol/evaluation-for-the-21st-century/chpt/introduction-scientific-realist-evaluation>.
49. Bergeron D, Gaboury I. Challenges Related to the Analytical Process in Realist Evaluation and Latest Developments on the Use of NVivo from a Realist Perspective. *Int J Soc Res Methodology*. 2020;23(3):355–365. Available from: https://www.researchgate.net/publication/337606523_Challenges_related_to_the_analytical_process_in_realist_evaluation_and_latest_developments_on_the_use_of_NVivo_from_a_realist_perspective. <https://doi.org/10.1080/13645579.2019.1697167>
50. Robins CS, Eisen K. Strategies for the Effective Use of NVivo in a Large-Scale Study: Qualitative Analysis and the Repeal of Don't Ask, Don't Tell. *Qualitative Inquiry*. 2017;23(10):768–778. Available from: https://www.researchgate.net/publication/319898048_Strategies_for_the_Effective_Use_of_NVivo_in_a_Large-Scale_Study_Qualitative_Analysis_and_the_Repeal_of_Don't_Ask_Don't_Tell. <https://doi.org/10.1177/1077800417731089>
51. Denyer D, Tranfield D, van Aken JE. Developing design propositions through research synthesis. *Organ Stud*. 2008;29(3):393–413. Available from: https://www.researchgate.net/publication/247734813_Developing_Design_Propositions_Through_Research_Synthesis. <https://doi.org/10.1177/0170840607088020>
52. De Weger E, Van Vooren NJE, Wong G, Dalkin S, Marchal B, Drewes HW, Baan CA. What's in a Realist Configuration? Deciding Which Causal Configurations to Use, How, and Why. *Int J Qual Methods*. 2020;19. Available from: https://pure.uvt.nl/ws/files/48023578/2020_12_21_de_Weger_E.pdf. <https://doi.org/10.1177/1609406920938577>
53. University of Washington. What is an implementation strategy?. Available from: <https://impsciuw.org/implementation-science/research/implementation-strategies/>. Cited 2023 Nov 20
54. McCormack B, Rycroft-Malone J, DeCorby K, Hutchinson AM, Bucknall T, Kent B, Schultz A, Snelgrove-Clarke E, Stetler C, Titler M, Wallin L. A Realist Review of Interventions and Strategies to Promote Evidence-Informed Healthcare: A Focus on Change Agency. *Implement Sci*. 2013;8:107. Available from: <https://implementationscience.biomedcentral.com/articles/https://doi.org/10.1186/1748-5908-8-107>. <https://doi.org/10.1186/1748-5908-8-107>
55. Public Health England. A brief introduction to realist evaluation. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1004663/Brief_introduction_to_realist_evaluation.pdf. Cited 2023 Nov 20
56. The Ramses II Project. What is a mechanism? What is a programme mechanism?. Available from: http://ramesesproject.org/media/RAMESES_II_What_is_a_mechanism.pdf. Cited 2023 Nov 20
57. Domingo A, Yessis J, Charles K, Skinner K, Hanning RM. Integrating Knowledge and Action: Learnings from an Implementation Program for Food Security and Food Sovereignty with First Nations Communities in Canada. *Research Square*. 2023;18:34. Available from: <https://implementationscience.biomedcentral.com/articles/https://doi.org/10.1186/s13012-023-01291-2>. <https://doi.org/10.1186/s13012-023-01291-2>
58. Miles S, Bright L, Burgess P, DeCambra MH, Enos RK, Kalilihiwa G, Oneha MF, Kintaro CK, Titcomb CH, Morimoto-Ching SS, Padilla K. Building the Beloved Community: Reflections in Understanding Relationships to Food for Native Hawaiians. *Prog Community Health Partnersh*. 2018;12(4):483–487. Available from: <https://pubmed.ncbi.nlm.nih.gov/30739902/>. <https://doi.org/10.1353/cpr.2018.0051>
59. Dickerson DL, Baldwin JA, Belcourt A, et al. Encompassing cultural contexts within scientific research methodologies in the development of health promotion interventions. *Prev Sci*. 2020;21:33–42. Available from: <https://pmc.ncbi.nlm.nih.gov/articles/PMC6311146/>
60. Whitesell NR, Mousseau A, Parker M, Rasmus S, Allen J. Promising practices for promoting health equity through rigorous intervention science with Indigenous communities. *Prev Sci*. 2020;21:2–12. Available from: <https://pubmed.ncbi.nlm.nih.gov/30443847/>
61. Lincoln YS, Guba EG. But is it rigorous? Trustworthiness and authenticity in naturalistic evaluation. *New Dir Program Eval*. 1986;30:73–84. Available from: https://www.researchgate.net/publication/229576278_But_Is_It_Rigorous_Trustworthiness_and_Authenticity_in_Naturalistic_Evaluation. <https://doi.org/10.1002/ev.1427>
62. Flynn R, Rotter T, Hartfield D, Newton AS, Scott SD. A realist evaluation to identify contexts and mechanisms that enabled and hindered implementation and had an effect on sustainability of a lean intervention in pediatric healthcare. *BMC Health Serv Res*. 2019;19(1). Available from: <https://bmchealthservres.biomedcentral.com/articles/https://doi.org/10.1186/s12913-019-4744-3>. <https://doi.org/10.1186/s12913-019-4744-3>
63. Porter S. Validity, trustworthiness and rigour: reasserting realism in qualitative research. *J Adv Nurs*. 2007;60(1):79–86. Available from: <https://pubmed.ncbi.nlm.nih.gov/17824942/>. <https://doi.org/10.1111/j.1365-2648.2007.04360.x>
64. Green J, Thorogood N. Qualitative methods for health research. 4th ed. London (UK): SAGE Publications Inc; 2018.
65. Tupai-Firestone R, Faeamani G, Okiakama E, Funaki T, Henry A, Prapavessis D, Masaga J, Firestone J, Tiatia-Seath J, Matheson A, Brown B, Schleser M, Kaholokula K, Ing C, Borman B, Ellison-Loschmann L. Pasifika Prediabetes Youth Empowerment Programme: learnings from a youth-led community-based intervention study. *Kōtuitui*. 2021;134(1530):57–68. Available from: <https://umimpact.umd.edu/en/publications/pasifika-prediabetes-youth-empowerment-programme-learnings-from-a>

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.